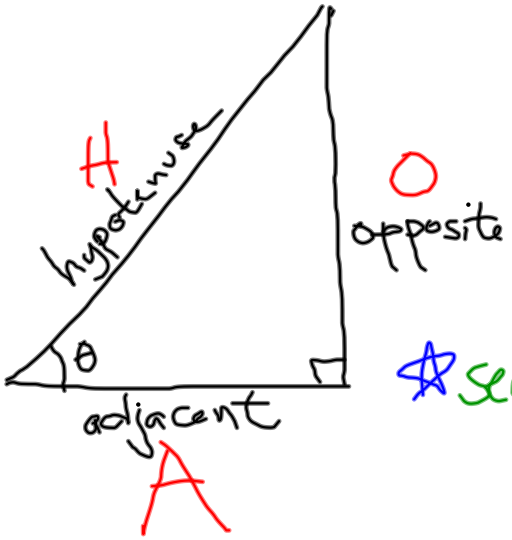
Trig



Cosecant = $\csc(\theta) = \frac{1}{\sin\theta} = \frac{hyp}{opp}$

★ Sine

$(\sin(\text{angle}\,\theta)) = \frac{\text{opposite}}{hyp\ldots}$

★ Cosine

$(\cos(\theta)) = \frac{\text{adjacent}}{hyp\ldots}$

★ Secant = $\sec(\theta) = \frac{1}{\cos\theta} = \frac{hyp}{adj}$

★ Tangent

$(\tan(\theta)) = \frac{\text{opposite}}{\text{adjacent}}$

SOHCAHTOA

Cotangent: $\cot(\theta) = \frac{1}{\tan\theta} = \frac{adj}{opp}$

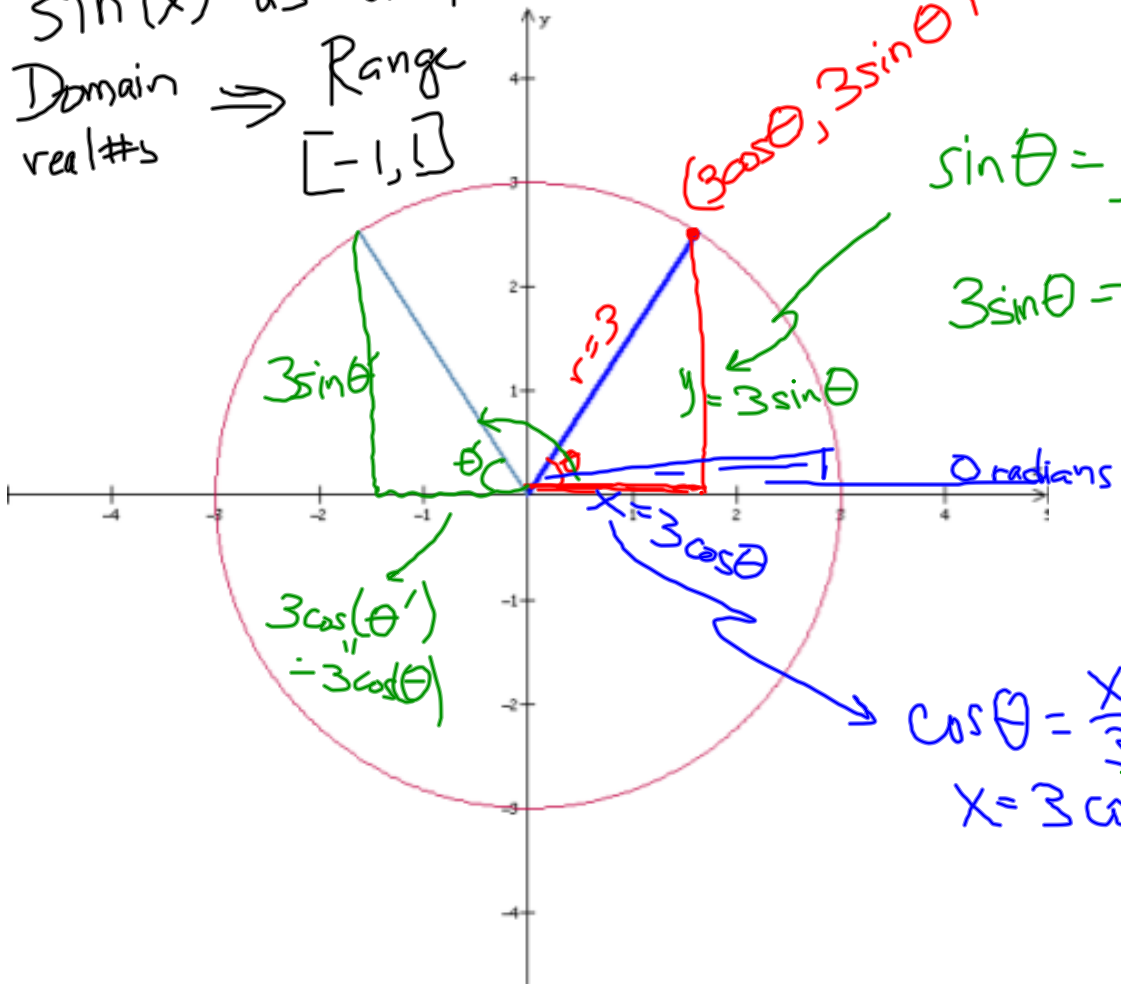
* Set calculators in degree mode
* Graph y=sin(x)
* 2nd+DRAW ... Tangent .... @ x=0, y=0
* Equation appears at bottom
* Record slope .0174533292 . . . .

** NOW ... set calculators to radian mode
* Graph y=sin(x)
* 2nd+DRAW ... Tangent .... @ x=0, y=0
* Equation appears at bottom
* Record slope 1

sin(x) as a function

Domain ⇒ Range

real #s [-1, 1]

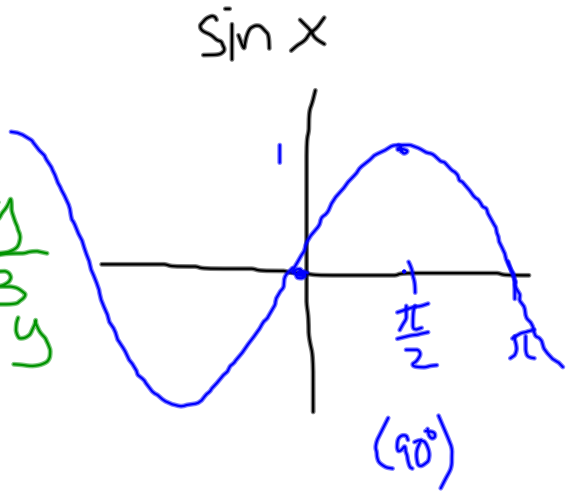


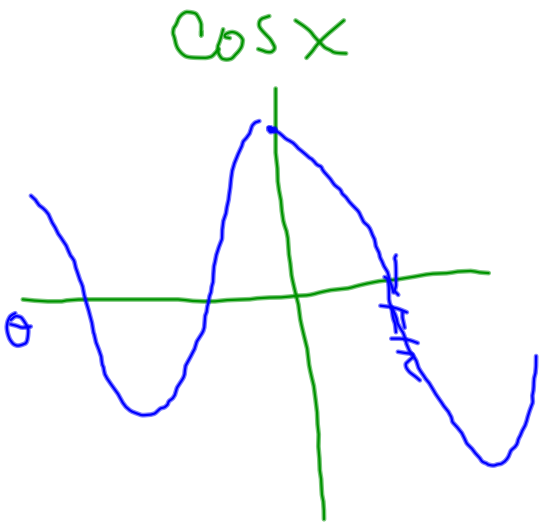
$\sin\theta = \frac{y}{3}$

$3\sin\theta = y$

$\cos\theta = \frac{x}{3}$

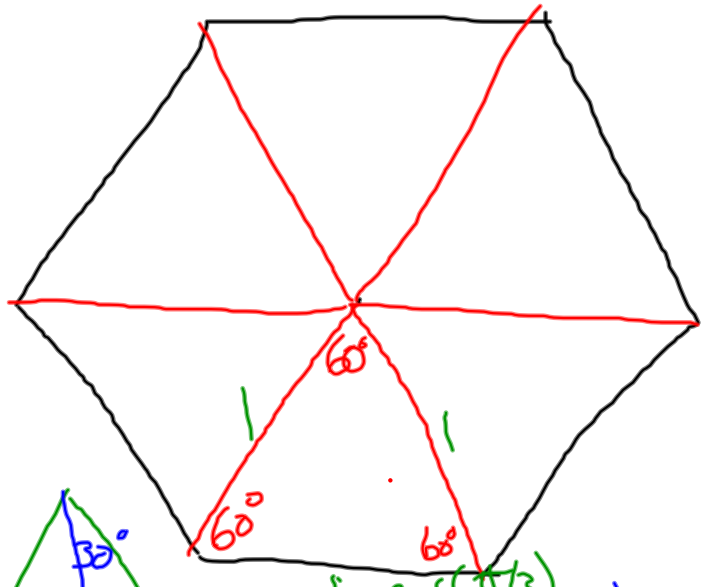
$x = 3\cos\theta$

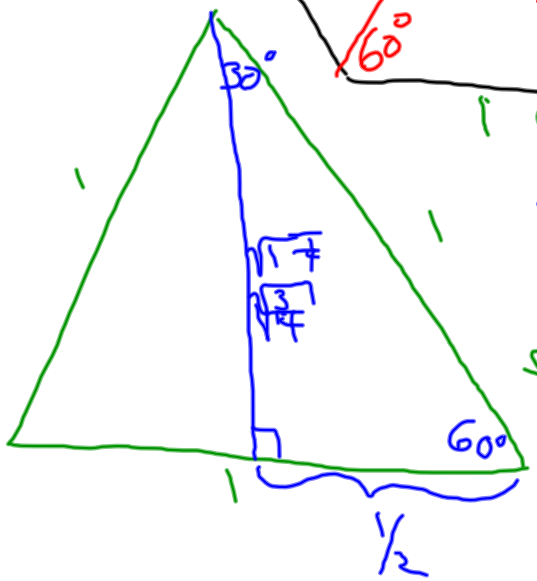




$$\sin\left(45°\right) = \frac{1}{\sqrt{2}}$$

$$\cos\left(\frac{\pi}{4}\right) = \frac{1}{\sqrt{2}}$$





$$\cos\left(\frac{\pi}{3}\right)$$

$$\sin\left(30° = \frac{\pi}{6}\right) = \frac{\frac{1}{2}}{1} = \frac{1}{2}$$

$$\cos\left(\frac{\pi}{6}\right) = \frac{\frac{\sqrt{3}}{2}}{1} = \frac{\sqrt{3}}{2}$$

$$\sin\left(\frac{\pi}{3}\right)$$

$$\lim_{x\to 0}\frac{\sin x}{x}=1$$

proof in book → trig

$\sin^2+\cos^2=1$

$\sin^2=1-\cos^2$

$-\sin^2=-1+\cos^2$

$\lim_{x\to 0}\frac{x}{\sin x}=\frac{1}{\lim_{x\to 0}\frac{\sin x}{x}}=\frac{1}{1}=1$

$$\lim_{x\to 0}\frac{\cos x-1}{x}=0$$

$$\lim_{x\to 0}\frac{(\cos x-1)}{x}\cdot\frac{(\cos x+1)}{(\cos x+1)}=\lim_{x\to 0}\frac{\cos^2 x-1}{x(\cos x+1)}$$

$$=\lim_{x\to 0}-\frac{\sin^2 x}{x(\cos x+1)}$$

$$=\lim_{x\to 0}-\left(\frac{\sin x}{x}\right)\left(\frac{\sin x\to 0}{\cos x+1\to 2}\right)=\frac{0}{2}$$

13) $\lim_{x\to\infty} \cos\left(\frac{1}{x}\right)$, $\frac{1}{x}\to 0$

$= 1$

14) $\lim_{x\to\infty} \sin\left(\frac{2}{x}\right) = 0$

16) $\lim_{h\to 0} \frac{\sin(h)}{2h} = \frac{1}{2}\lim_{h\to 0} \frac{\sin(h)}{h} = \frac{1}{2}(1)$

17) $\lim_{\theta\to 0} \frac{3\sin(3\theta)}{3\theta}$

$3\lim_{\theta\to 0} \frac{\sin(3\theta)}{(3\theta)}$

$3\theta\to 0$

$u = 3\theta$

$3\lim_{u\to 0} \frac{\sin(u)}{u} = 3(1) = 3$

$\sin(3\theta) \neq 3\sin(\theta)$

$\lim_{\theta\to 0} 3\frac{\sin(3\theta)}{3\theta}$

$\lim_{x\to 0} \frac{\sin x}{x}$

18) $\lim_{\theta \to 0^+} \frac{\sin\theta}{\theta^2}$

$= \lim_{\theta \to 0^+} \left(\frac{\sin\theta}{\theta}\right)\left(\frac{1}{\theta}\right)$

$= \lim_{\theta \to 0^+} \left(\frac{\sin\theta}{\theta}\right) \lim_{\theta \to 0^+} \left(\frac{1}{\theta}\right) \to +\infty$

19) $\lim_{x \to 0^-} \frac{\sin(x)}{|x|} = \lim_{x \to 0^-} \frac{\sin x}{-x}$

$= -1$

20) $\lim_{x \to 0} \frac{\sin^2 x}{3x^2}$

$\lim_{x \to 0} \left(\frac{1}{3}\right)\left(\frac{\sin x}{x}\right)\left(\frac{\sin x}{x}\right)$

$= \left(\frac{1}{3}\right)(1)(1) = \frac{1}{3}$

21) $\lim_{x \to 0^+} \frac{\sin x}{5\sqrt{x}}$

$= \left(\lim_{x \to 0^+} \frac{\sin x}{5\sqrt{x}} \cdot \frac{\sqrt{x}}{\sqrt{x}}\right)$

$= \lim_{x \to 0^+} \left(\frac{1}{5}\right)\left(\frac{\sin x}{x}\right)\left(\frac{\sqrt{x}}{1}\right)$

$\left(\frac{1}{5}\right)(1)(0)$

22) $\lim_{x \to 0} \frac{\sin(6x)}{\sin(8x)}$

$\lim_{x \to 0} \frac{6}{8}\left(\frac{\sin(6x)}{6x}\right)\left(\frac{8x}{\sin(8x)}\right)$

$= \left(\frac{6}{8}\right)(1)(1)$

sin: function from angles

$0 \to 90^\circ \to$

$[-1, 1]$

SOHCAHTOA

Cosecant = $\csc(\theta) = \frac{1}{\sin\theta} = \frac{\text{hypotenuse}}{\text{opposite}}$

Sine

$\sin(\theta) = \frac{\text{opposite}}{\text{hypotenuse}}$

Secant = $\sec\theta = \frac{1}{\cos\theta} = \frac{\text{hypotenuse}}{\text{adjacent}}$

Cosine

$\cos(\theta) = \frac{\text{adjacent}}{\text{hypotenuse}}$

Cotangent = $\cot\theta = \frac{1}{\tan\theta} = \frac{\text{adjacent}}{\text{opposite}}$

Tangent

$\tan(\theta) = \frac{\text{opposite}}{\text{adjacent}}$

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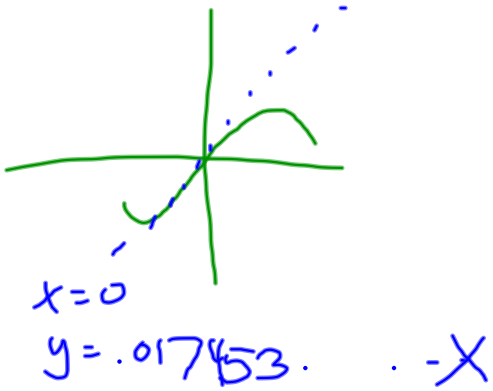

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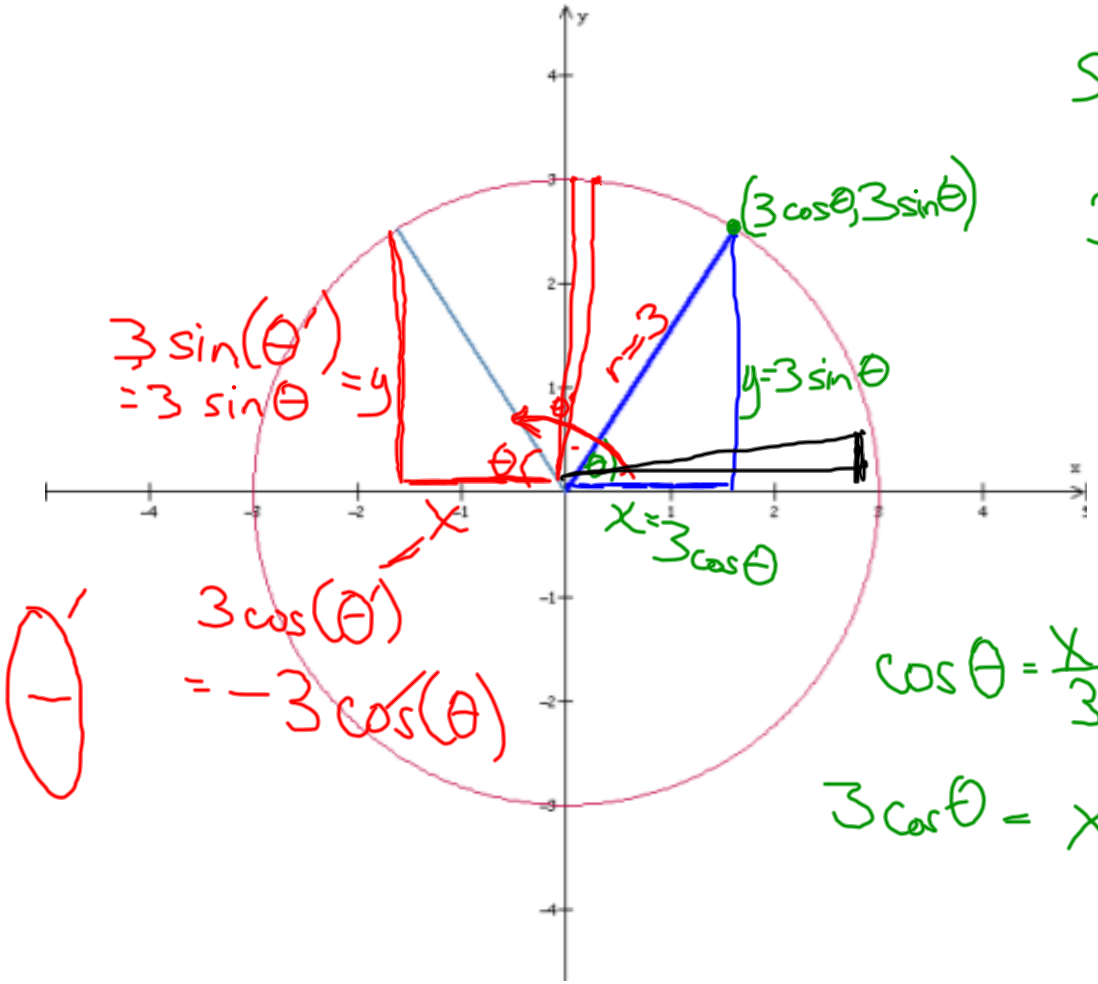

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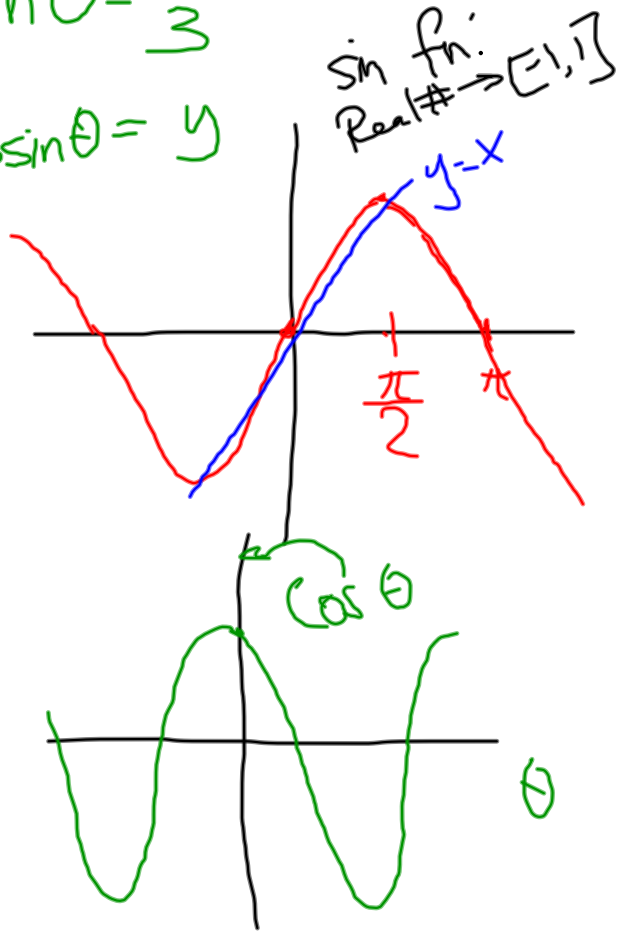
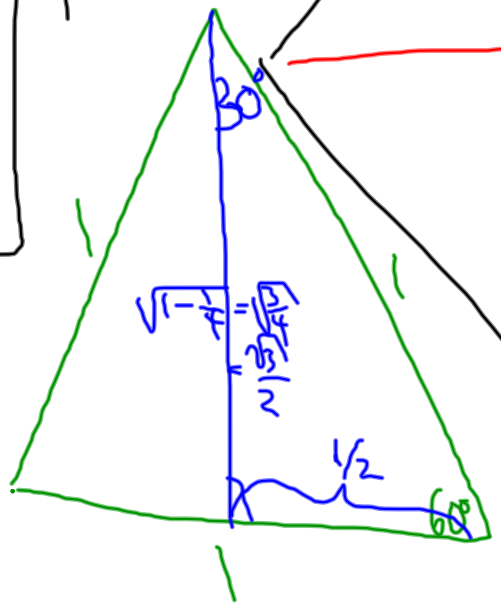


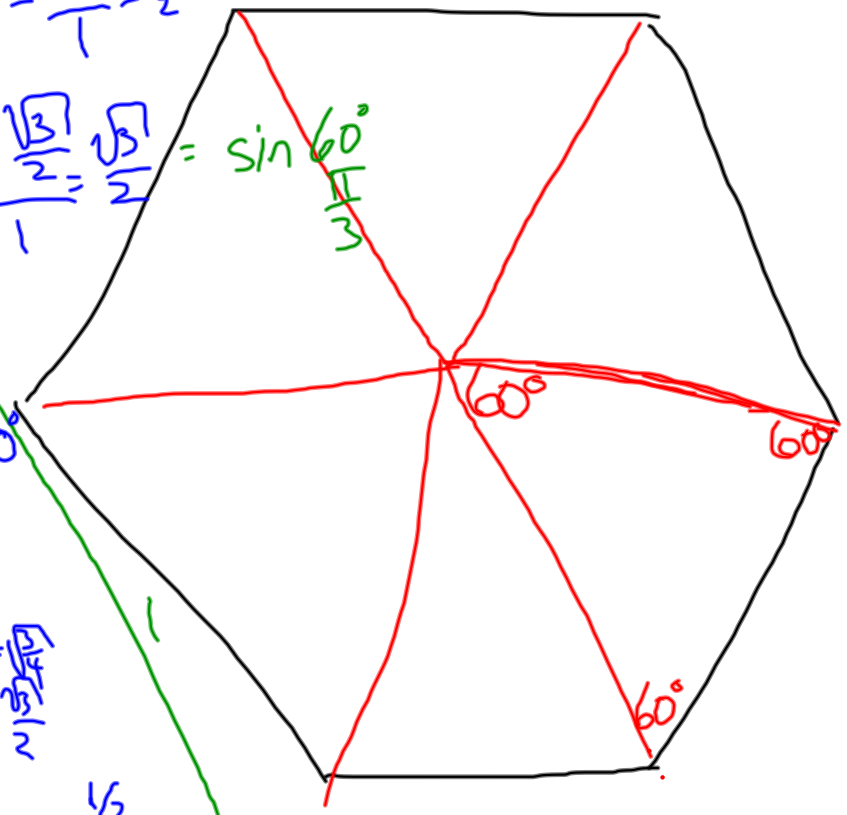
$\sin 45^\circ = \frac{1}{\sqrt{2}}$

$\cos 45^\circ = \frac{1}{\sqrt{2}}$

$\sin \underset{\frac{\pi}{6}}{30^\circ} = \frac{\frac{1}{2}}{1} = \frac{1}{2} = \cos 60^\circ = \cos \frac{\pi}{3}$

$\cos 30^\circ = \frac{\frac{\sqrt{3}}{2}}{1} = \frac{\sqrt{3}}{2} = \sin 60^\circ \; \frac{\pi}{3}$



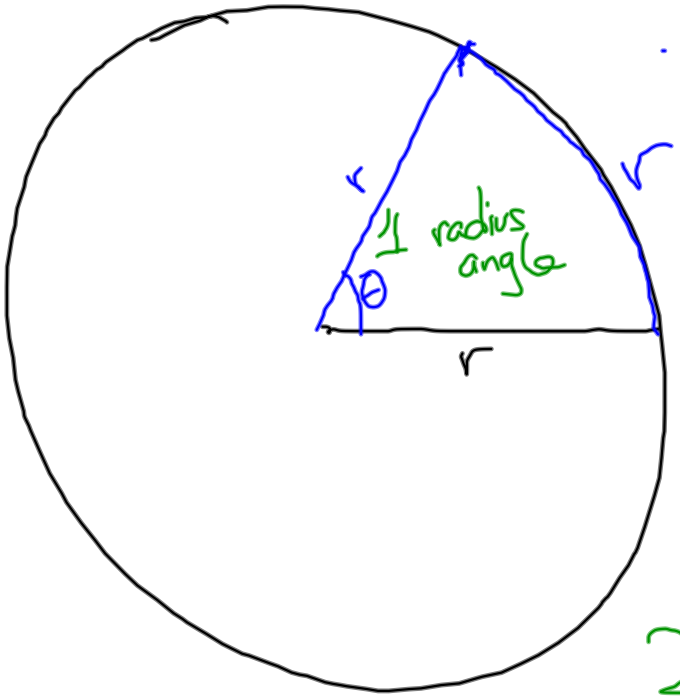


Circumference: $2\pi r$

Area $= 2\pi r^2$

Area of 2 circles of radius r

$A = \pi r^2$



$\frac{2\pi r}{r}$

$= 2\pi$ of them

radians

$$\lim_{x \to 0} \frac{\sin x}{x} = 1$$

$$\lim_{x \to 0} \frac{\cos x - 1}{x} = 0$$